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Small Diameter Bomb Won't Rely On GPS Alone: Secretary

By Ron Lorenzo

The Air Force wants one of its most vital future bombs to hit targets without solely relying on Global Positioning System satellites because of concerns that the signals can be jammed, the service's secretary said.

The decision to use guidance other than GPS to direct the second generation of the Small Diameter Bomb, stated by Air Force Secretary James Roche Wednesday on Capitol Hill, shows the limits of satellite guidance, despite its success in Afghanistan and elsewhere.

"We already know that the world understands how dependent we are on GPS and therefore will work hard to find ways to thwart it," Roche said.

It is not yet clear which method of guidance might augment or replace GPS, but several are on the drawing board.

The GPS-guided Joint Direct Attack Munition, made by Boeing, made its debut in Yugoslavia in 1999 and has been dropped in quantity by the Navy, Marine Corps and Air Force in Afghanistan. But the vulnerability of GPS signals to jamming and the difficulties of hitting moving targets with satellite-guided weapons are causing service leaders to consider other alternatives.

The Small Diameter Bomb is intended to destroy moving targets deep in enemy territory, one of the service's toughest technology challenges.

Destroying "elusive" or "fleeting" targets is becoming a service priority, one that becomes even more important as enemies respond to U.S. air dominance by hiding and moving their most important weapons systems.

The military has long been able to attack moving targets with weapons guided by lasers or steered by a controller watching a TV screen, but such systems require that an aircraft loiter near the target, exposing itself to enemy.

The Small Diameter Bomb, or SDB, is intended to be a lightweight, fire-and-forget weapon that can be launched a safe distance away from hostile targets. Because the bomb would only weigh 250 pounds, strike aircraft—especially the F-22 Raptor—could carry more of them and hit more targets per sortie.

Roche said the service is working hard to develop an effective system against moving targets. "Because movers that are deep in hostile territory are clearly a major danger to us, whether it's SA-6s [surface-to-air missiles] or it's Transporter-Erector-Launchers with Scuds, or other sorts of systems, if we don't get to these, they're going to get us," he said.

Roche said that back in 1986, when he was an executive at Northrop Grumman, he wrote a paper for the Israelis describing how a time would come when "we will be inviting other countries to use cruise missiles against us" because the United States would have systems that could reliably stymie other weapons.

"These cruise missiles will come in low, from many azimuths, they don't behave according to Newtonian physics, and they are very difficult to deal with," Roche said.

Russia already builds supersonic anti-ship cruise missiles, some of which have been acquired by China. Roche said cruise missiles can be fired from trucks and other vehicles, making them especially hard to find and destroy.

Small bomb, smart sergeants

In September, the Air Force awarded both Boeing and Lockheed Martin \$47 million development contracts to design a phase one SDB that would use GPS to attack fixed targets and a seeker for a phase two variant that would attack moving targets. The Air Force will select a winner in October 2003.

The service plans to buy 12,000 of the fixed-target SDBs and 12,000 of the moving-target version, acquisition officials said. The plan is to start initial production of the fixed-target version in fiscal 2005 and the moving-target version in fiscal 2009. The target cost is \$64,000 per bomb for the initial version, and \$107,000 for the follow-on.

Roche did not specify what type of guidance system would be used for the second generation SDB. But one method of finding and tracking elusive targets could be relying on the eyes and wits of Air Force and Army spotters on the ground, typically sergeants in the special operations forces. "What you saw us do in Afghanistan with our wonderful air commandos, with the sergeants on the ground is the tip-off for the future," Roche said.

Networked solutions

Defense analyst Loren Thompson of the Arlington, Va.-based Lexington Institute said the military could use frequency-hopping to make the GPS signal impossible to jam. But because a moving target's global coordinates are constantly changing, a reliable GPS signal only solves one problem.

A full solution, Thompson said, could be to link the bomb into an information system that fuses knowledge from many sensors to form a real-time picture of the battlefield. "This is another manifestation of network-centric warfare," he said. "The network will provide the information as to precisely where the target is. And then the munition, which itself will be fairly cheap, will be able to ride that information in real time right down to the precise location of the intended target."

In this scenario, the sensors that hunt for targets and the systems that link and coordinate that information become as important as the bomb itself.

"If you don't have the ability to localize where the target is continuously, then the GPS really isn't very useful to you," Thompson said.

Other targeting technologies could also be used in conjunction with GPS, he said.

"I think it's highly likely that the second or third generation of SDB will still have GPS, because by that time you'll have a GPS chip that will cost less than \$100, but it will rely either secondarily or primarily on other ways of localizing and acquiring the target," he said.

JDAM, although commonly referred to as being "GPS-guided," actually depends primarily on a gyroscope-based Inertial Navigation System (INS), which gets updates from GPS signals. A 2,000-pound JDAM is supposed to be accurate to within 30 meters using only INS, Boeing officials said.

Some analysts are skeptical about the Air Force's ability to build a reliable second-generation SDB with a reasonable price tag.

Steve Zaloga, a missile analyst with the Teal Group, a Fairfax, Va.-based marketing research firm, said the military is working on more advanced seeker heads and hoping for advances in civilian technology to bring costs down.

Seekers can steer infrared-, laser- and video-weapons. But they are expensive and have size and electrical power requirements that could overwhelm a small bomb, he said.

"I can understand why they're trying to do this, but [it's] going to be a lot dodgier, a lot more 'down the road' than the GPS/INS version," he said.

The Air Force should have little trouble miniaturizing the GPS/INS system on the JDAM for use on a first-generation small bomb.

"The second- generation one is going to have the same afflictions that a lot of their other so-called low-cost guided weapons have had," he said. "They've tried to do this in the past with other programs and usually they just run into a brick wall of ... size and complexity and the associated second problem of cost."